SYNOPSIS V1.0:
Proton Displacement Testing of the TIL601 Phototransistor

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I. INTRODUCTION

This study was undertaken to determine the proton-induced degradation of the TIL601 phototransistor. The devices were provided by the HST WFC2. The devices were exposed to protons at the University of California at Davis Crocker Nuclear Laboratory. The phototransistor output was monitored for radiation-induced degradation at various fluence levels.

II. DEVICES TESTED

The Texas Instruments TIL601 is an N-P-N planar silicon phototransistor. Two samples were tested (SN3 and SN4). These devices are discreet components therefore no delidding was needed prior to exposure.

III. TEST FACILITY

Facility: University of California at Davis Crocker Nuclear Laboratory.
Flux: $1.7x10^8$ protons/cm^2/s.
Proton Energy: 63 MeV

IV. TEST METHODS

Case Temperature: ambient in air
Test setup and approach for light output measurements: The test setup is essentially the same as the "GSFC Approach for Proton Effects Characterization of LEDs" [1]. In this case, the phototransistor is exposed and the LED is constant and of known light output.

V. RESULTS

Figure 1 shows the degradation (I/I_o) of both phototransistors at each exposure level (fluence) when V_{CC}=5.0V. The current (I) is measured across the load R2 following the phototransistor at each fluence level and is normalized to the pre-irradiation current (I_o). There is a significant amount of degradation seen in both devices after $6.4x10^{10}$p/cm^2. Following the final step (total fluence is $1.53x10^{11}$p/cm^2), the device performance has degraded significantly, to less than 30% of its initial value.

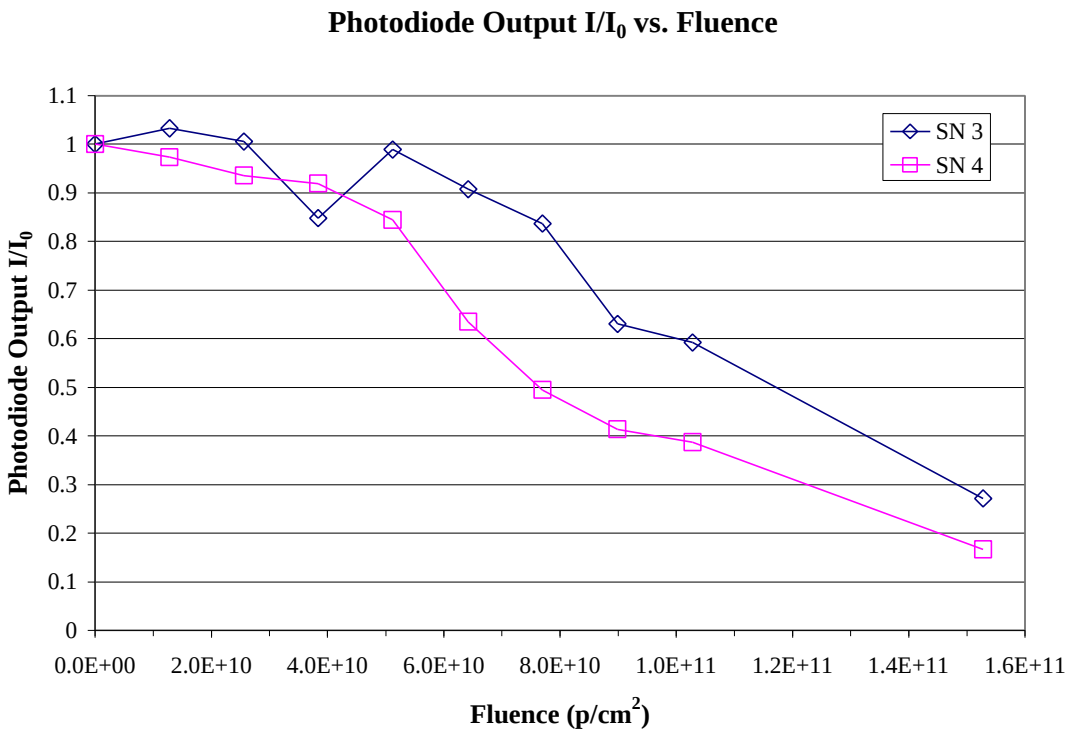

Figure 1. Proton induced degradation of the current for both TIL601 phototransistors. The photodiode current was normalized to the pre-radiation values.

V. REFERENCES

[1] R.A. Reed, P.W. Marshall, C.J. Marshall, K.A. LaBel, "GSFC Approach for Proton Effects Characterization of LEDs", sent as an addendum.